

Math1071 Fall 2015, Exam 1 practice problems

1. Find the domain of each of the following functions:

(a) $f(x) = 2x^3 + 7x - 5$

(b) $g(x) = \sqrt{x+1}$

(c) $h(x) = \frac{x^2+1}{x^2-1}$

(d) $k(x) = \frac{3x}{\sqrt{x-2}}$

(e) $j(x) = \ln(2x+3)$

2. Solve the following equations for x :

(a) $\frac{1}{3^{-x}} \cdot 9^{x+1} = 1$

(b) $4^{2x} = 8^{9x+15}$

(c) $5^{2x-1} \cdot 5 = \frac{1}{5^x}$

(d) $2 \log_{10}(x+7) + 3 = 0$

(e) $7 \cdot 3^{2x+4} - 1 = 0$

(f) $\log_2(2x-2) - \log_2(x-1) = 0$

(g) $\ln(x^2+2) - \ln(3x) = 0$

3. Second National Bank offers a saving account that earns 3.6% per year, compounded quarterly.

(a) How much should you invest right now in the account in order to have \$18,000.00 in 18 months?

(b) Find the effective yield.

4. Given the cost and revenue functions $C(x) = 2x + 10$ and $R(x) = -2x^2 + 20x$ that represent the number of dollars spent or made respectively on the sale of x units of a certain commodity.

(a) Find the maximal revenue.

(b) Find the break-even quantities.

5. Sadie purchased a new laptop six months ago for \$1,800.00. Based on an article she found on a consumer product information website, she estimates that the value of her computer five months from now will be \$1,382.00. Assuming linear depreciation, find the equation that relates the value V of the laptop to the number of months t since Sadie purchased the laptop.

6. Irwin Music sells its brand of acoustic guitars at \$190.00 each. The company incurs costs of \$55.00 to manufacture each guitar. The associated weekly fixed costs for the company are \$18,500.00.

(a) Determine the linear equation relating weekly profit P to the number x of acoustic guitars produced.

- (b) What is the break-even quantity?
 (c) Determine the break-even revenue, rounded to the nearest cent.
7. How long will it take an investment to double if it is continuously compounded at 10% per year?
8. Find the following limits. If a limit does not exist, then explain why.

(a)

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x^2 - 8x + 12}$$

(b)

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x^2 - 8x}$$

(c)

$$\lim_{x \rightarrow 2} \frac{x^2 + x}{x^2 - 8x + 12}$$

9. Consider the following function

$$f(x) = \begin{cases} x^2 - x + 3 & \text{if } x < 1 \\ 2 & \text{if } x = 1 \\ \frac{6x-6}{x^2-1} & \text{if } x > 1. \end{cases}$$

- (a) Find $\lim_{x \rightarrow 1^+} f(x)$.
 (b) Find $\lim_{x \rightarrow 1^-} f(x)$.
 (c) Find $\lim_{x \rightarrow 1} f(x)$.
 (d) Where is $f(x)$ continuous? State your answer in interval notation.
10. Find the average rate of change of $f(x) = 4x^3 - 2x^2 + 7x + 1$ over the following intervals:
- (a) $[1, 4]$
 (b) $[1, 2]$
 (c) $[1, 1.5]$
 (d) $[1, 1.1]$
 (e) $[1, 1.01]$
11. Use the limit definition of the derivative to find $f'(x)$. Write an equation of the tangent line to the graph of $f(x)$ at the indicated point.
- (a) $f(x) = 5x^2 + 7x - 3$, $x = 0$
 (b) $f(x) = \frac{9}{x-3}$, $x = 1$
12. Find the derivative. You may use whatever rules are appropriate.
- (a) $f(x) = 3x^3 - 10x^2 + 5x - 1$
 (b) $g(x) = 5 \ln(x^3) + 7e^x + 7e^3$
 (c) $h(x) = \frac{x}{3} + 3\sqrt{x} - \frac{3}{\sqrt{x}} + \frac{5}{\sqrt[3]{x^2}}$
 (d) $k(x) = \frac{1+x+4x^2}{x}$